

## WHAT IS CLAIMED IS:

1           1.     A concrete mixing truck for transporting concrete from one  
2 location to another comprising:  
3                 a chassis including: a frame, a first power source coupled to the  
4 frame, wheels coupled to the frame, and a first drivetrain coupling the first  
5 power source and the wheels;  
6                 a second drivetrain coupled to a second power source; and  
7                 a mixing drum coupled to the frame and to the second drivetrain,  
8 the drum comprising:  
9                 a wall including an inner surface defining a volume and an  
10 outer surface; and  
11                 at least one formation coupled to the wall and extending  
12 from the inner surface of the wall, the formation including a body and a  
13 support member disposed within the body.

1           2.     The concrete mixing truck of claim 1, wherein the formation and  
2 the wall are integrally formed as part of a single unitary body.

1           3.     The concrete mixing truck of claim 1, wherein the first power  
2 source and the second power source are the same power source.

1           4.     The concrete mixing truck of claim 1, wherein the formation  
2 includes a base region, an intermediate region, and an end region.

1           5.     The concrete mixing truck of claim 4, wherein the support  
2 member is embedded within the end region of the formation.

1           6.     The concrete mixing truck of claim 5, further comprising at least  
2 one spacer embedded within the end region.

1           7.     The concrete mixing truck of claim 6, wherein the at least one  
2 spacer resiliently engages the support member.

1           8.     The concrete mixing truck of claim 7, wherein the at least one  
2 spacer extends from the support member to an exterior of the formation.

1           9.     The concrete mixing truck of claim 8, wherein the at least one  
2 spacer substantially surrounds the support member.

1           10.    The concrete mixing truck of claim 9, wherein the body is a first  
2 material and wherein the first material flows around the at least one spacer  
3 when the first material is in an uncured state.

1           11.    The concrete mixing truck of claim 8, wherein the at least one  
2 spacer includes apertures through which the first material flows to encapsulate  
3 at least a portion of the at least one spacer.

1           12.    The concrete mixing truck of claim 9, wherein the at least one  
2 spacer is a helical spring.

1           13.    The concrete mixing truck of claim 9, wherein the at least one  
2 spacer includes an outside diameter and an inside diameter.

1           14.    The concrete mixing truck of claim 13, wherein at least a portion  
2 of the outside diameter of the at least one spacer lies on the surface of the  
3 formation.

1           15.    The concrete mixing truck of claim 1, wherein the support  
2 member is torsionally flexible.

1           16.    The concrete mixing truck of claim 1, wherein the support  
2 member is a composite.

1           17.    The concrete mixing truck of claim 16, wherein the composite  
2 includes fibers and a resin.

1           18.    The concrete mixing truck of claim 17, wherein the fibers include  
2 one of carbon and graphite fibers.

1           19.    The concrete mixing truck of claim 17, wherein the resin is a  
2   urethane-based resin.

1           20.    The concrete mixing truck of claim 1, wherein the support  
2   member has a circular cross-section.

1           21.    The concrete mixing truck of claim 4, wherein the base region of  
2   the formation is tapered.

1           22.    The concrete mixing truck of claim 1, wherein the wall includes at  
2   least one seam.

1           23.    The concrete mixing truck of claim 22, further comprising a ramp  
2   extending from the inner surface of the wall proximate the seam.

1           24.    The concrete mixing truck of claim 1, wherein the drum further  
2   comprises a drive ring coupled to the wall.

1           25.    The concrete mixing truck of claim 1, wherein the wall includes an  
2   opening.

1           26.    The concrete mixing truck of claim 25, wherein the drum includes  
2   a hatch cover engaging the opening.

1           27.    The concrete mixing truck of claim 1, wherein the hatch cover  
2   includes a first panel on a first side of the opening and a second panel on a  
3   second side of the opening, and wherein the first panel is coupled to the  
4   second panel.

1           28.    A heavy duty rotary concrete mixing drum for coupling to a  
2   vehicle having a powered drivetrain for rotating the drum, the drum comprising:  
3                   a wall including an inner surface defining a volume and an outer  
4   surface; and

5                   at least one projection coupled to the wall and extending from the  
6 inner surface of the wall, the projection including a body and a support member  
7 disposed within the body.

1           29.   The mixing drum of claim 28, wherein the projection and the wall  
2 are integrally formed as part of a single unitary body.

1           30.   The mixing drum of claim 28, wherein the projection includes a  
2 base region, an intermediate region, and an end region.

1           31.   The mixing drum of claim 30, wherein the support member is  
2 embedded within the end region of the projection.

1           32.   The mixing drum of claim 31, further comprising at least one  
2 spacer embedded within the end region.

1           33.   The mixing drum of claim 32, wherein the at least one spacer  
2 resiliently engages the support member.

1           34.   The mixing drum of claim 33, wherein the at least one spacer  
2 member extends from the support member to an exterior of the projection.

1           35.   The mixing drum of claim 34, wherein the at least one spacer  
2 substantially surrounds the support member.

1           36.   The mixing drum of claim 32, wherein the body is a first material  
2 and wherein the first material flows around the at least one spacer when the  
3 first material is in an uncured state.

1           37.   The mixing drum of claim 36, wherein the at least one spacer  
2 includes apertures through which the first material flows to encapsulate at  
3 least a portion of the at least one spacer.

1           38.   The mixing drum of claim 35, wherein the spacer is a helical  
2 spring.

1           39. The mixing drum of claim 35, wherein the at least one spacer  
2 includes an outside diameter and an inside diameter.

1           40. The mixing drum of claim 39, wherein at least a portion of the  
2 outside diameter of the at least one spacer lies on the surface of the  
3 projection.

1           41. The mixing drum of claim 28, wherein the support member is  
2 torsionally flexible.

1           42. The mixing drum of claim 28, wherein the support member is a  
2 composite.

1           43. The mixing drum of claim 42, wherein the composite includes  
2 fibers and a resin.

1           44. The mixing drum of claim 43, wherein the fibers are one of carbon  
2 and graphite fibers.

1           45. The mixing drum of claim 43, wherein the resin is a urethane-  
2 based resin.

1           46. The mixing drum of claim 28, wherein the support member has a  
2 circular cross-section.

1           47. The mixing drum of claim 30, wherein the base region of the  
2 projection is tapered.

1           48. The mixing drum of claim 28, wherein the wall includes at least  
2 one seam.

1           49. The mixing drum of claim 49, wherein the wall includes a ramp  
2 extending from the inner surface of the wall proximate the seam.

1           50. The mixing drum of claim 28, wherein the drum further comprises  
2 a drive ring coupled to the wall.

1           51.    The mixing drum of claim 28, wherein the wall includes an  
2 opening.

1           52.    The mixing drum of claim 51, wherein the drum includes a hatch  
2 cover engaging the opening.

1           53.    The mixing drum of claim 52, wherein the hatch cover includes a  
2 first panel on a first side of the opening and a second panel on a second side of  
3 the opening, and wherein the first panel is coupled to the second panel.

1           54.    The mixing drum of claim 28, wherein the projection extends  
2 around the inner surface of the wall in the form of an archimedial spiral.

1           55.    The mixing drum of claim 28, wherein the wall comprises an inner  
2 layer and an outer layer.

1           56.    The mixing drum of claim 55, wherein the first layer is an  
2 elastomeric material.

1           57.    The mixing drum of claim 56, wherein the outer layer is a fiber  
2 reinforced composite material.

1           58.    The mixing drum of claim 57, wherein the projection and the inner  
2 layer are integrally-formed as part of single unitary body.

1           59.    A support member for use in a formation provided within a heavy  
2 duty, rotary concrete mixing drum capable of attachment to a vehicle, the  
3 formation promoting the mixing and discharge of the concrete, the support  
4 member comprising a plurality of fibers and a resin.

5           60.    The support member of claim 59, wherein the resin is a polymeric  
6 resin.

1           61.    The support member of claim 60, wherein the polymeric resin is a  
2 urethane-based resin.

1           62.    The support member of claim 59, wherein the fibers are one of  
2 carbon and graphite fibers.

1           63.    The support member of claim 59, wherein the support member is  
2 torsionally flexible.

1           64.    The support member of claim 59, wherein the support member is  
2 an elongated member having the shape of an archimedian spiral.

1           65.    A spiraling formation for use within a composite, heavy duty,  
2 rotary concrete mixing drum capable of attachment to a vehicle and having an  
3 inner wall, the formation comprising:

4                   a body configured to extend inwardly from an inner wall of the  
5 drum and defining the shape of the integral formation, the body having a base  
6 portion and a free end;

7                   a support member located proximate the free end of the body and  
8 extending the length of the body; and

9                   a plurality of spacer members spaced apart along the length of the  
10 support member; the spacer members including at least one aperture through  
11 with the body extends; and

12                   wherein the body substantially surrounds the support member and  
13 the plurality of spacer members.

1           66.    The formation of claim 65, wherein the body is a polymeric  
2 material.

1           67.    The formation of claim 65, wherein each spacer member  
2 substantially surrounds the support member.

1           68.    The formation of claim 65, wherein the spacer member is a helical  
2 spring.

1           69.    The formation of claim 68, wherein the base portion of the body  
2 is tapered.

1           70. The formation of claim 69, wherein the greatest width of the  
2 tapered base portion is approximately six inches.

1           71. The formation of claim 70, wherein the greatest height of the  
2 tapered base portion is approximately five inches from the inside surface of the  
3 mixing drum.

1           72. A method of forming a projection comprising the steps of:  
2           providing a mold;  
3           inserting a torsionally flexible support member into the mold;  
4           supplying a fluid polyurethane into the mold such that the fluid  
5 polyurethane flows through the mold and around the support member.

1           73. The method of claim 72, further comprising the step of positioning  
2 the support member within the mold.

1           74. The method of claim 73, further comprising the step of coupling  
2 at least one spacer to the support member to position the support member in  
3 the mold.

1           75. The method claim 74, wherein the at least one spacer includes an  
2 aperture.

1           76. The method of claim 75, further comprising the step of supplying  
2 the fluid polyurethane to the aperture of the at least one spacer.

3           77. A spiraling formation for use within a composite, heavy duty,  
4 rotary concrete mixing drum capable of attachment to a vehicle and having an  
5 inner wall, the formation comprising:

6           a body configured to extend inwardly from an inner wall of the  
7 drum and defining the shape of the integral formation, the body having a base  
8 portion and a free end; and



9                   a support member located proximate the free end of the body and  
10 extending the length of the body, the support member being torsionally  
11 flexible.

1           78.   The formation of claim 77, wherein the support member is a  
2 composite.

1           79.   The formation of claim 78, wherein the composite includes fibers  
2 and a resin.

1           80.   The formation of claim 79, wherein the fibers include one of  
2 carbon and graphite fibers.

1           81.   The formation of claim 79, wherein the resin is a urethane-based  
2 resin.

## AMENDED CLAIMS

[received by the International Bureau on 02 June 2004 (02.06.04);  
Claims 1,6,8,11,14,27,28,32,34,37,38,40,56,59 amended.; claim 63 deleted; claims 64-81  
replaced by amended claims 63-80; remaining claims unchanged. (9 pages)]

1           1.     A concrete mixing truck for transporting concrete from one  
2 location to another comprising:

3                 a chassis including: a frame, a first power source coupled to the  
4 frame, wheels coupled to the frame, and a first drivetrain coupling the first  
5 power source and the wheels;

6                 a second drivetrain coupled to a second power source; and  
7                 a mixing drum coupled to the frame and to the second drivetrain,  
8 the drum comprising:

9                     a wall including an inner surface defining a volume and an  
10 outer surface; and

11                     at least one formation coupled to the wall and extending  
12 from the inner surface of the wall, the formation including a body, a  
13 support member disposed within the body, and at least one spacer  
14 disposed proximate the support member, at least a portion of the spacer  
15 being encapsulated by the body.

1           2.     The concrete mixing truck of claim 1, wherein the formation and  
2 the wall are integrally formed as part of a single unitary body.

1           3.     The concrete mixing truck of claim 1, wherein the first power  
2 source and the second power source are the same power source.

1           4.     The concrete mixing truck of claim 1, wherein the formation  
2 includes a base region, an intermediate region, and an end region.

1           5.     The concrete mixing truck of claim 4, wherein the support  
2 member is embedded within the end region of the formation.

1           6.     The concrete mixing truck of claim 5, wherein the at least one  
2 spacer is embedded within the end region.

1           7.     The concrete mixing truck of claim 6, wherein the at least one  
2 spacer resiliently engages the support member.

1           8.     The concrete mixing truck of claim 7, wherein the at least one  
2 spacer extends from the support member to an exterior of the body.

1           9.     The concrete mixing truck of claim 8, wherein the at least one  
2 spacer substantially surrounds the support member.

1           10.    The concrete mixing truck of claim 9, wherein the body is a first  
2 material and wherein the first material flows around the at least one spacer  
3 when the first material is in an uncured state.

1           11.    The concrete mixing truck of claim 10, wherein the at least one  
2 spacer includes at least one aperture through which the first material flows to  
3 encapsulate at least a portion of the at least one spacer.

1           12.    The concrete mixing truck of claim 9, wherein the at least one  
2 spacer is a helical spring.

1           13.    The concrete mixing truck of claim 9, wherein the at least one  
2 spacer includes an outside diameter and an inside diameter.

1           14.    The concrete mixing truck of claim 13, wherein at least a portion  
2 of the outside diameter of the at least one spacer lies on the surface of the  
3 body.

1           15.    The concrete mixing truck of claim 1, wherein the support  
2 member is torsionally flexible.

1           16.    The concrete mixing truck of claim 1, wherein the support  
2 member is a composite.

1           17.    The concrete mixing truck of claim 16, wherein the composite  
2 includes fibers and a resin.

1           18.    The concrete mixing truck of claim 17, wherein the fibers include  
2 one of carbon and graphite fibers.

1           19.    The concrete mixing truck of claim 17, wherein the resin is a  
2 urethane-based resin.

1           20.    The concrete mixing truck of claim 1, wherein the support  
2 member has a circular cross-section.

1           21.    The concrete mixing truck of claim 4, wherein the base region of  
2 the formation is tapered.

1           22.    The concrete mixing truck of claim 1, wherein the wall includes at  
2 least one seam.

1           23.    The concrete mixing truck of claim 22, further comprising a ramp  
2 extending from the inner surface of the wall proximate the seam.

1           24.    The concrete mixing truck of claim 1, wherein the drum further  
2 comprises a drive ring coupled to the wall.

1           25.    The concrete mixing truck of claim 1, wherein the wall includes an  
2 opening.

1           26.    The concrete mixing truck of claim 25, wherein the drum includes  
2 a hatch cover engaging the opening.

1           27.    The concrete mixing truck of claim 26, wherein the hatch cover  
2 includes a first panel on a first side of the opening and a second panel on a  
3 second side of the opening, and wherein the first panel is coupled to the  
4 second panel.

1           28.    A heavy duty rotary concrete mixing drum for coupling to a  
2 vehicle having a powered drivetrain for rotating the drum, the drum comprising:

3 a wall including an inner surface defining a volume and an outer  
4 surface; and

5 at least one projection coupled to the wall and extending from the  
6 inner surface of the wall, the projection including a body, a support member  
7 disposed within the body, and at least one spacer disposed proximate the  
8 support member, at least a portion of the spacer being encapsulated by the  
9 body.

1 29. The mixing drum of claim 28, wherein the projection and the wall  
2 are integrally formed as part of a single unitary body.

1 30. The mixing drum of claim 28, wherein the projection includes a  
2 base region, an intermediate region, and an end region.

1 31. The mixing drum of claim 30, wherein the support member is  
2 embedded within the end region of the projection.

1 32. The mixing drum of claim 31, wherein the at least one spacer is  
2 embedded within the end region.

1 33. The mixing drum of claim 32, wherein the at least one spacer  
2 resiliently engages the support member.

1 34. The mixing drum of claim 33, wherein the at least one spacer  
2 extends from the support member to an exterior of the body.

1 35. The mixing drum of claim 34, wherein the at least one spacer  
2 substantially surrounds the support member.

1 36. The mixing drum of claim 32, wherein the body is a first material  
2 and wherein the first material flows around the at least one spacer when the  
3 first material is in an uncured state.

1           37.    The mixing drum of claim 36, wherein the at least one spacer  
2 includes at least one aperture through which the first material flows to  
3 encapsulate at least a portion of the at least one spacer.

1           38.    The mixing drum of claim 35, wherein the at least one spacer is a  
2 helical spring.

1           39.    The mixing drum of claim 35, wherein the at least one spacer  
2 includes an outside diameter and an inside diameter.

1           40.    The mixing drum of claim 39, wherein at least a portion of the  
2 outside diameter of the at least one spacer lies on the surface of the body.

1           41.    The mixing drum of claim 28, wherein the support member is  
2 torsionally flexible.

1           42.    The mixing drum of claim 28, wherein the support member is a  
2 composite.

1           43.    The mixing drum of claim 42, wherein the composite includes  
2 fibers and a resin.

1           44.    The mixing drum of claim 43, wherein the fibers are one of carbon  
2 and graphite fibers.

1           45.    The mixing drum of claim 43, wherein the resin is a urethane-  
2 based resin.

1           46.    The mixing drum of claim 28, wherein the support member has a  
2 circular cross-section.

1           47.    The mixing drum of claim 30, wherein the base region of the  
2 projection is tapered.

1           48.    The mixing drum of claim 28, wherein the wall includes at least  
2 one seam.

1           49.    The mixing drum of claim 49, wherein the wall includes a ramp  
2   extending from the inner surface of the wall proximate the seam.

1           50.    The mixing drum of claim 28, wherein the drum further comprises  
2   a drive ring coupled to the wall.

1           51.    The mixing drum of claim 28, wherein the wall includes an  
2   opening.

1           52.    The mixing drum of claim 51, wherein the drum includes a hatch  
2   cover engaging the opening.

1           53.    The mixing drum of claim 52, wherein the hatch cover includes a  
2   first panel on a first side of the opening and a second panel on a second side of  
3   the opening, and wherein the first panel is coupled to the second panel.

1           54.    The mixing drum of claim 28, wherein the projection extends  
2   around the inner surface of the wall in the form of an archimedial spiral.

1           55.    The mixing drum of claim 28, wherein the wall comprises an inner  
2   layer and an outer layer.

1           56.    The mixing drum of claim 55, wherein the inner layer is an  
2   elastomeric material.

1           57.    The mixing drum of claim 56, wherein the outer layer is a fiber  
2   reinforced composite material.

1           58.    The mixing drum of claim 57, wherein the projection and the inner  
2   layer are integrally-formed as part of single unitary body.

1           59.    A support member for use in a formation provided within a heavy  
2   duty, rotary concrete mixing drum capable of attachment to a vehicle, the  
3   formation promoting the mixing and discharge of the concrete, the support

4 member comprising a plurality of fibers and a resin and being torsionally  
5 flexible.

6 60. The support member of claim 59, wherein the resin is a polymeric  
7 resin.

1 61. The support member of claim 60, wherein the polymeric resin is a  
2 urethane-based resin.

1 62. The support member of claim 59, wherein the fibers are one of  
2 carbon and graphite fibers.

1 63. The support member of claim 59, wherein the support member is  
2 an elongated member having the shape of an archimedian spiral.

1 64. A spiraling formation for use within a composite, heavy duty,  
2 rotary concrete mixing drum capable of attachment to a vehicle and having an  
3 inner wall, the formation comprising:

4 a body configured to extend inwardly from an inner wall of the  
5 drum and defining the shape of the spiraling formation, the body having a base  
6 portion and a free end;

7 a support member located proximate the free end of the body and  
8 extending the length of the body; and

9 a plurality of spacer members spaced apart along the length of the  
10 support member, each of the spacer members including at least one aperture  
11 through which the body extends; and

12 wherein the body substantially surrounds the support member and  
13 the plurality of spacer members.

1 65. The formation of claim 64, wherein the body is a polymeric  
2 material.

1 66. The formation of claim 64, wherein each spacer member  
2 substantially surrounds the support member.



1           67.    The formation of claim 64, wherein at least one of the spacer  
2 members is a helical spring.

1           68.    The formation of claim 67, wherein the base portion of the body  
2 is tapered.

1           69.    The formation of claim 68, wherein the greatest width of the  
2 tapered base portion is approximately six inches.

1           70.    The formation of claim 69, wherein the greatest height of the  
2 tapered base portion is approximately five inches from the inside surface of the  
3 mixing drum.

1           71.    A method of forming a projection comprising the steps of:  
2                   providing a mold;  
3                   inserting a torsionally flexible support member into the mold;  
4                   supplying a fluid polyurethane into the mold such that the fluid  
5 polyurethane flows through the mold and around the support member.

1           72.    The method of claim 71, further comprising the step of positioning  
2 the support member within the mold.

1           73.    The method of claim 72, further comprising the step of coupling  
2 at least one spacer to the support member to position the support member in  
3 the mold.

1           74.    The method of claim 73, wherein the at least one spacer includes  
2 an aperture.

1           75.    The method of claim 74, further comprising the step of supplying  
2 the fluid polyurethane to the aperture of the at least one spacer.

3           76.    A spiraling formation for use within a composite, heavy duty,  
4 rotary concrete mixing drum capable of attachment to a vehicle and having an  
5 inner wall, the formation comprising:

6 a body configured to extend inwardly from an inner wall of the  
7 drum and defining the shape of the spiraling formation, the body having a base  
8 portion and a free end; and

9 a support member located proximate the free end of the body and  
10 extending the length of the body, the support member being torsionally  
11 flexible.

1 77. The formation of claim 76, wherein the support member is a  
2 composite.

1 78. The formation of claim 77, wherein the composite includes fibers  
2 and a resin.

1 79. The formation of claim 78, wherein the fibers include one of  
2 carbon and graphite fibers.

1 80. The formation of claim 78, wherein the resin is a urethane-based  
2 resin.